

WHAT IS CLAIMED IS:

1. A bispecific molecule comprising:
 - (a) a first recognition binding moiety that binds a C3b-like receptor; and
 - (b) one or more second recognition binding moieties that binds a molecule; said molecule being other than a C3b-like receptor;wherein said first recognition binding moiety is cross-linked via a poly-(ethylene) glycol (PEG) linker to the second recognition binding moieties.
2. The bispecific molecule of claim 1, wherein said molecule is desired to be reduced in amount in the circulation of a mammal.
3. The bispecific molecule of claim 1, wherein the molecule is a pathogenic antigenic molecule.
4. The bispecific molecule of claim 3, wherein said pathogenic antigenic molecule is an autoimmune antigen.
5. The bispecific molecule of claim 1, wherein the molecule is an antigen of an infectious disease agent.
6. The bispecific molecule of claim 1, wherein said second recognition binding moiety is an antibody or an antigen binding antibody fragment thereof that binds an antigenic molecule.
7. The bispecific molecule of claim 6, wherein said antigen binding antibody fragment, is selected from a group consisting of Fab, Fab', (Fab)'2, Fv or an sFv fragment.
8. The bispecific molecule of claim 1, wherein said second recognition binding moiety is a polypeptide, a peptide, an epitope, an antigenic determinant, a nucleic acid molecule, or a small molecule.
9. The bispecific molecule of claim 1, wherein said second recognition binding moiety binds the protective antigen (PA) protein of *Bacillus anthracis* (Anthrax).
10. The bispecific molecule of claim 1, wherein said poly-(ethylene) glycol (PEG) linker is a bifunctional poly-(ethylene) glycol (PEG) molecule, having the formula X-PEG-Y, wherein X and Y are functional groups.
11. The bispecific molecule of claim 1 or 10, wherein the poly-(ethylene) glycol (PEG) linker comprises a linear PEG molecule.

12. The bispecific molecule of claim 1 or 10, wherein the poly-(ethylene) glycol (PEG) linker comprises a non-linear PEG molecule.

13. The bispecific molecule of claim 12, wherein the non-linear poly-(ethylene) glycol (PEG) linker comprises a branched poly-(ethylene) glycol (PEG), linear forked poly-(ethylene) glycol (PEG), or branched forked poly-(ethylene) glycol (PEG) molecule.

14. The bispecific molecule of claim 10, wherein the X and Y functional groups are identical.

15. The bispecific molecule of claim 10, wherein the X and Y functional groups are different.

16. The bispecific molecule of claim 1, wherein said first and second recognition binding moieties comprise proteins, and wherein the bifunctional PEG linker derivatizes one or more amino acids within the first recognition binding moiety or the second recognition binding moieties.

17. The bispecific molecule of claim 16, wherein said amino acids are on the surface of the first or second recognition binding moieties.

18. The bispecific molecule of claim 17, wherein said amino acids are lysines, cyteines, histidines, serines, threonines, glutamic acids or arginines.

19. The bispecific molecule of claim 1, wherein said first and second recognition binding moieties comprise proteins, and wherein the bifunctional PEG linker derivatizes the N-terminal amino group of the first recognition binding moiety or the second recognition binding moieties.

20. The bispecific molecule of claim 1, wherein said first and second recognition binding moieties comprise proteins, and wherein the bifunctional PEG linker derivatizes the C-terminal carboxylic acid of the first recognition binding moiety or the second recognition binding moieties.

21. The bispecific molecule of claim 1, wherein said first recognition binding moiety that binds a C3b-like receptor is a monoclonal antibody that binds CR1.

22. The bispecific molecule of claim 21, wherein said second recognition binding moiety is cross-linked to the heavy or light chain of the first recognition binding moiety, with the proviso that said cross-linking is not via the carboxy terminus.

23. The bispecific molecule of claim 21, wherein said monoclonal antibody is a murine monoclonal antibody.

24. The bispecific molecule of claim 21, wherein said monoclonal antibody is a humanized monoclonal antibody.

25. The bispecific molecule of claim 1 or 10, wherein the molecular weight of the poly-(ethylene) glycol (PEG) molecule is 5 to 500 Daltons.

26. The bispecific molecule of claim 1 or 10, wherein the molecular weight of the poly-(ethylene) glycol (PEG) molecule is 200 to 20,000 Daltons.

27. The bispecific molecule of claim 1 or 10, wherein the molecular weight of the poly-(ethylene) glycol (PEG) molecule is 500 to 1000 Daltons.

28. The bispecific molecule of claim 1 or 10, wherein the molecular weight of the poly-(ethylene) glycol (PEG) molecule is 1000 to 8000 Daltons.

29. A method of producing a population of bispecific molecules, said method comprising contacting an antibody that binds a C3b-like receptor with one or more recognition binding moieties, wherein said antibody is conjugated with a bifunctional poly-(ethylene) glycol (PEG) linker, and wherein said one or more recognition binding moieties are derivatized to react with the bifunctional poly-(ethylene) glycol (PEG) linker, and wherein said one or more recognition binding moieties bind a molecule; under conditions such that said derivatized recognition binding moieties react to form a covalent linkage with the PEG linker, thereby producing a population of bispecific molecules.

30. The method of claim 29, wherein said molecule is desired to be reduced in amount in the circulation of a mammal.

31. The method of claim 29, wherein said one or more recognition binding moieties are derivatized by a method comprising thiolating said one or more recognition binding moieties with a thiol specific derivatizing agent.

32. The method of claim 31, wherein said thiol specific derivatizing agent is selected from a group consisting of succinimidyl-3-(2-pyridylthio-propionate) (SPDP), or succinimidyl acetylthioacetate (SATA).

33. The method of claim 29, wherein said one or more recognition binding moieties are derivatized by a method comprising modifying said one or more recognition binding moieties with a hydrazine or aldehyde modification reagent.

34. The method of claim 33, wherein said hydrazine modification reagent is succinimidyl 6-hydrazinonicotinate acetone hydrazone (SANH) or succinimidyl 4-formyl benzoate (SFB).

35. The method of claim 29, wherein said bifunctional poly-(ethylene) glycol (PEG) molecule is a heterobifunctional poly-(ethylene) glycol (PEG), having the formula X-PEG-Y.

36. The method of claim 35, wherein said heterobifunctional poly-(ethylene) glycol (PEG) is selected from the group consisting of NHS-PEG maleimide, NHS-PEG-vinylsulfone, bis-hydrazide-PEG, aldehyde-PEG-NHS, and bis-hydrazine-PEG.

37. A method of producing a population of bispecific molecules said method comprising:

- (a) contacting an anti-CR1 antibody with NHS-poly-(ethylene) glycol (PEG)-maleimide, such that the anti-CR1 antibody is derivatized at one or more sites with the NHS functional group of the NHS-PEG-maleimide;
- (b) contacting a recognition binding moiety with N-succinimidyl-S-acetyl-thioacetate (SATA), such that the antigen recognition binding moiety is derivatized to contain one or more free thiol, and wherein said recognition binding moiety binds a molecule;
- (c) combining the poly-(ethylene) glycol (PEG)-derivatized anti-CR1 antibody produced in step (a) with the thiol derivatized recognition binding moiety produced in step (b);

thereby producing a population of bispecific molecules.

38. The method of claim 37, wherein said recognition binding moiety binds the protective antigen (PA) protein of *Bacillus anthracis* (Anthrax).

39. The method of claim 37, wherein said molecule is an autoimmune antigen or is an antigen of an infectious disease agent.

40. The method of claim 37, wherein said molecule is the protective antigen (PA) protein of *Bacillus anthracis* (Anthrax).

41. The method of claim 37, wherein said step (c) is carried out by a method comprising mixing said PEG-derivatized anti-CR1 antibody and said SATA-derivatized recognition binding moiety at a molar ratio of 1:1.

42. The method of claim 37, wherein said step (c) is carried out by a method comprising mixing said PEG-derivatized anti-CR1 antibody and said SATA-derivatized recognition binding moiety at a molar ratio of 2:1.

43. The method of claim 37 or 29, further comprising isolating and purifying said population of bispecific molecules.

44. The method of claim 43, wherein said method for isolating and purifying said population of bispecific molecules comprises size exclusion chromatography.

45. The method of claim 37, wherein said anti-CR1 antibody is derivatized with NHS-PEG-maleimide at a molar ratio of 1:4, anti-CR1 antibody:NHS-PEG-maleimide.

46. The method of claim 37, wherein said anti-CR1 antibody is derivatized with NHS-PEG-maleimide at a molar ratio of 1:8, anti-CR1 antibody:NHS-PEG-maleimide.

47. The method of claim 37, wherein said anti-CR1 antibody is derivatized with NHS-PEG-maleimide at a molar ratio of 1:16, anti-CR1 antibody:NHS-PEG-maleimide.

48. The method of claim 37, wherein said recognition binding moiety is derivatized with N-succinimidyl-S-acetyl-thioacetate (SATA) at a molar ratio of 1:4, recognition binding moiety:SATA.

49. The method of claim 37, wherein said recognition binding moiety is derivatized with N-succinimidyl-S-acetyl-thioacetate (SATA) at a molar ratio of 1:8, recognition binding moiety:SATA.

50. The method of claim 37, wherein said recognition binding moiety is derivatized with N-succinimidyl-S-acetyl-thioacetate (SATA) at a molar ratio of 1:16, recognition binding moiety:SATA.

51. A population of bispecific molecules produced by the method of claim 29 or 37.

52. A method of producing a population of antibodies that bind a C3b-like receptor comprising a polyethylene glycol linker, said method comprising contacting the antibodies with a polyethylene glycol linker, such that the antibodies are derivatized at one or more sites with the polyethylene glycol linker, thereby producing a population of PEG-derivatized antibodies.

53. The method of claim 52, wherein said PEG-derivatized antibodies bind the C3b-like receptor with an activity at least 50% of the antibodies that contained no PEG derivatives.

54. The population of the PEG-derivatized antibodies produced by the method of claim 52.

55. A pharmaceutical composition comprising a therapeutically effective amount of the bispecific molecule of any one of claims 1-28, said amount being effective for treating a mammal having an undesirable condition associated with the presence of said molecule in the circulation of a mammal, and a pharmaceutically acceptable carrier.

56. A kit comprising:

- (a) a first container comprising a polyethylene glycol-derivatized anti-CR1 antibody;
- (b) a second container comprising a recognition binding moiety, said recognition binding moiety being other than an anti-CR1 antibody; and
- (c) a third container comprising a derivatizing agent suitable to derivatize said one or more recognition binding moieties.

57. The bispecific molecule of claim 21, wherein said one or more second recognition binding moieties are antibodies, and wherein said bispecific molecule is oxidized at one or more carbohydrate moieties within the Fc region of the first or second recognition binding moieties, and wherein said oxidized carbohydrate is the site at which a PEG linker is derivatized.

58. The bispecific molecule of claim 10, wherein the first or second recognition binding moieties is an antibody and wherein the PEG linker derivatizes one or more oxidized carbohydrate moieties within the Fc region of the first or second recognition binding moieties.

59. The bispecific molecule of claim 57 or 58, wherein said oxidized carbohydrate moieties are oxidized chemically or enzymatically.

60. The bispecific molecule of any of claims 1-13, wherein said first recognition binding moiety binds CR1.

61. A method of treating a disorder in a mammal comprising administering a therapeutically effective amount of the bispecific molecule of any one of claims 1-28, wherein said disorder is associated with the presence of said molecule in the circulation of the mammal.

62. A method of producing a population of bispecific molecules said method comprising:

- (a) contacting an anti-CR1 antibody with NHS-poly-(ethylene) glycol (PEG)-benzaldehyde, such that the anti-CR1 antibody is derivatized at one or more sites with the NHS functional group;
- (b) contacting a recognition binding moiety with C6 4-hydrazino-nicotinamide acetone hydrazone such that the antigen recognition binding moiety is derivatized, and wherein said recognition binding moiety binds a molecule; and
- (c) combining the poly-(ethylene) glycol (PEG)-derivatized anti-CR1 antibody produced in step (a) with the hydrazone derivatized recognition binding moiety produced in step (b);

thereby producing a population of bispecific molecules.

63. The bispecific molecule of claim 1, wherein the PEG linker is NHS-poly-(ethylene) glycol (PEG)-benzaldehyde.

64. A population of bispecific molecules produced by the method of claim 62.

65. A bispecific molecule comprising:

- (a) a first recognition binding moiety that binds a C3b-like receptor; and
- (b) one or more second recognition binding moieties that binds a molecule; said molecule being other than a C3b-like receptor;

wherein said first recognition binding moiety is cross-linked via an NHS-poly-(ethylene) glycol (PEG)-benzaldehyde linker to the second recognition binding moieties.

66. The bispecific molecule of claim 65, wherein the first recognition binding moiety is a deimmunized anti-CR1 monoclonal antibody.

67. The bispecific molecule of claim 66, wherein the deimmunized anti-CR1 monoclonal antibody is H9.

68. The method of claim 62, wherein said recognition binding moiety binds the protective antigen (PA) protein of *Bacillus anthracis* (Anthrax).

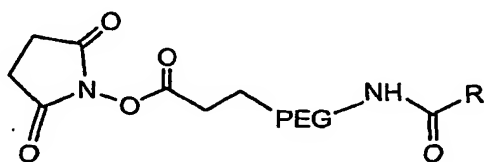
69. The method of claim 62, wherein said molecule is an autoimmune antigen or is an antigen of an infectious disease agent.

70. The method of claim 62, wherein said molecule is the protective antigen (PA) protein of *Bacillus anthracis* (Anthrax).

71. A pharmaceutical composition comprising a therapeutically effective amount of the bispecific molecule of any one of claims 65-67, said amount being effective for treating a mammal having an undesirable condition associated with the presence of said molecule in the circulation of a mammal, and a pharmaceutically acceptable carrier.

72. A method of treating a disorder in a mammal comprising administering a therapeutically effective amount of the bispecific molecule of any one of claims 65-67, wherein said disorder is associated with the presence of said molecule in the circulation of the mammal.

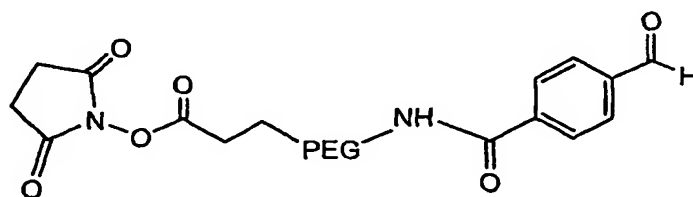
73. A compound of the formula:



(I)

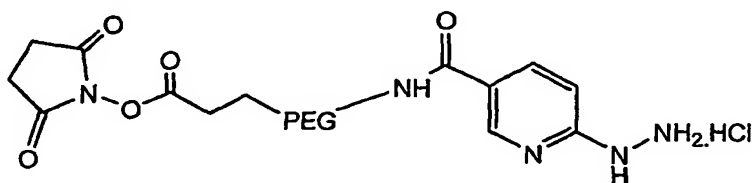
or a pharmaceutically acceptable salt thereof, wherein R is phenyl, naphthyl, or aromatic heterocycle, any of which is substituted with at least one -C(O)H or -NH-NH₂ group.

74. The compound of claim 73 having the formula:



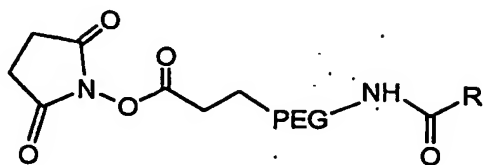
or a pharmaceutically acceptable salt thereof.

75. The compound of claim 73 having the formula:



76. An antibody derivatized with the compound of any one of claims 73-75.

77. The method of claim 29, wherein said linker is a compound of the formula:



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